

With the last two species of snails there are two factors to be taken into consideration concerning their presence in that part of Pennsylvania. First, that the climatic conditions have been favorable for their existence in this part of the state, that their food has always been available, and that the river courses have made easy routes of distribution to make the northward migration desirable. Second, that this apparent northward migration might be a resettlement or repopulation of territory once occupied by these species before they were driven southward by the encroachment of the last glacier.

To have a complete knowledge of the molluscan fauna of Pennsylvania more thorough collecting must be made in some of the less accessible places in this state, especially those in the more mountainous sections of the central part.

NEW MEXICAN SPECIES OF *SPIRAXIS*

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This constitutes part 5 of a series on Mexican mollusks collected for Dr. Bryant Walker in 1926. The first paper appeared (1928) as Occasional Papers Mus. Zool. Univ. Michigan, no. 193, in which the symbols for localities are explained on pp. 2-25.

SPIRAXIS (*RECTAXIS*) *GRANUM*, new species.

Shell (pl. 9, f. 5) cylindrical-turrite, light corneous to whitish, glassy and transparent, with very low, flattened growth-threads. Whorls $7\frac{3}{4}$, flattened convex, with rather shallow, weakly crenulate suture. Apex large; embryonic whorls about 3, quite rapidly widening; first $1\frac{1}{4}$ almost smooth; remainder gradually assuming rounded growth-threads, demarcated by incised lines with weak traces of spiral striae. Later whorls medium in length, very gradually increasing, with low, flattened growth-threads, which die out basally on last whorl and are more than $\frac{1}{2}$ width of their interspaces, that show fine growth-striae but lack definite spirals; first neanic whorl with 37 threads; second with 40; third with 42 and last whorl with 45. Aperture oval-trapezoidal, with longest dimension about 35° to shell-axis; peristome simple, almost vertical and very little arcuate; columella almost straight, rounded and quite heavy, tapering more abruptly towards basal end. Alt. 2.97 mm., diam. 31 (0.93 mm.), alt. last whorl 39 (1.16 mm.);

aperture alt. 23 (0.69 mm.), diam. 67 (0.46 mm.). Another (station 54) measures: alt. 3.22, diam. 28 (0.89), alt. last whorl 39 (1.25); aperture alt. 23 (0.74), diam. 66 (0.49); $7\frac{1}{8}$ whorls. Anatomy (to be figured) similar to that of *S. intermedius* but free oviduct (UV) relatively larger and prostate and ovotestis simpler. Radular formula: 12-1-(2+10); teeth more elongate.

Below Necaxa (D, III, a, 52), alt. 3120 ft.; common. *S. granum* is quite variable in shape and columella. It may be the same as *S. linearis* Pfeiffer, which probably was founded on a young or paedogenetoid shell, but the latter appears to have more closely spaced threads and longer, more oblique whorls.

SPIRAXIS (RECTAXIS) SUBTILIS, new species.

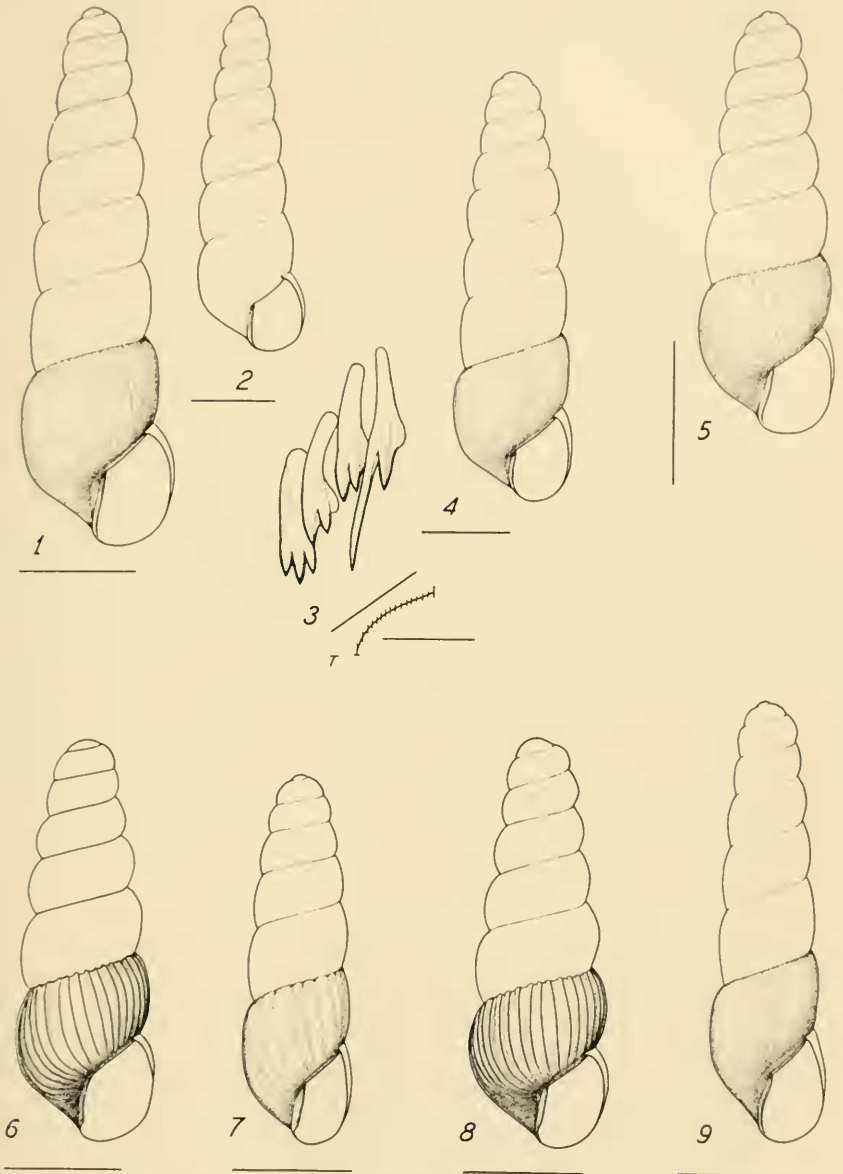
Shell (pl. 9, f. 1) subulate, light corneous, glassy and almost transparent, with numerous incised growth-lines. Whorls $9\frac{1}{2}$, flat-sided, with simple, rather shallow, overriding suture. Apex smaller than in *S. granum*; embryonic whorls $2\frac{3}{4}$, short, quite rapidly widening; first almost smooth; otherwise as in *S. granum*. Later whorls becoming longer and gradually widening, with sculpture of incised growth-lines and interspaces that slope outwards (rise) in direction of growth (*i.e.*, like the surface of a shingled roof) and, especially on the earlier whorls, may be thickened just before each impressed line so as to approach the condition in *S. granum*; first neanic whorl with about 47 lines; second with 38; third with 41; fourth with 48; fifth with 50 and last with 51. Aperture trapezoidal-ovate, with longest dimension about 30° to shell-axis; peristome simple, almost vertical and very little arcuate; columella narrow, slightly oblique and almost straight. Alt. 4.58, diam. 28 (1.29), alt. last whorl 36 (1.66); aperture alt. 21 (0.96), diam. 68 (0.65).

Las Tortolas, Córdoba (D, I, a, 4), 2625-3000 ft.; quite rare. *S. subtilis* is somewhat similar to, but has a smaller apex and longer, more rectilinear whorls than *S. rhabdus* Pilsbry.

S. (R.) SUBTILIS VITREUS, new subspecies.

Shell (pl. 9, f. 2) similar to *S. subtilis* but with shorter, more convex and more rapidly widening whorls. First neanic whorl with 42 growth-lines; second with 40; third with 43; fourth with 49 and fifth and last each with 50. Alt. 4.16, diam. 31 (1.28), alt. last whorl 37 (1.54); aperture alt. 21 (0.89), diam. 73 (0.65); almost 9 whorls.

Below Necaxa (D, I, a, 54), 2625 ft.; quite rare. This subspecies can scarcely be *S. confertestriatus* (S. & P.) since it has two



1, *Spiraxis subtilis*. 2, *S. subtilis vitreus*. 3,4, *Spiraxis subnitidus*. 5, *S. granum*. 6, *Spiraxis parvus* (NAUTILUS, 52: 134). 7, *S. futilis*. 8, *S. subgranum*. 9, *S. subopacas*.

more whorls although somewhat smaller and appears to have a very much straighter columella than the latter.

SPIRAXIS (RECTAXIS) SUBNITIDUS, new species.

Shell (pl. 9, f. 4) light corneous, similar in shape and size to *S. subtilis*, but with more closely spaced, weaker growth-striae, like *S. nitidus persulcatus*. Whorls 9, relatively shorter than in *S. subtilis*. Embryonic whorls $2\frac{3}{4}$, with 2 almost smooth. Later whorls with irregular growth-striae, even more numerous than in *S. n. persulcatus*; first with 67; second with 70; third with 73 and last with 74. Columella very slightly concave and evenly rounded (more spirally wound than in *S. subtilis*). Alt. 4.87, diam. 27 (1.30), alt. last whorl 35 (1.69); aperture alt. 20 (0.95), diam. 70 (0.67). Radular formula (f. 3): 15-1-(2+13).

Above Neaxa (B, II, a, 33), 5000 ft.; rare. This may be *S. nitidus minor* Martens (1898), which was founded on S. & P.'s form B, but is certainly not *S. acus minor* F. & C. (1877). As Strebel und Pfeffer suggested, this species somewhat resembles their *S. confertestriatus* (not seen by me), to which *S. delicatus* Pilsbry must be somewhat similar (although considerably smaller), but *S. subnitidus* apparently has much weaker striae and appears quite glossy to the unaided eye.

SPIRAXIS (VERSUTAXIS) SUBGRANUM, new species.

Shell (pl. 9, f. 8) cylindric-turrite, silvery white to whitish corneous, translucent, with well spaced, very low riblets. Whorls $7\frac{1}{2}$, quite convex although progressively less so, with well impressed, weakly eremulate suture. Apex relatively large; embryonic whorls $2\frac{3}{4}$, rapidly widening; first two almost smooth. Later whorls gradually increasing, with very low, flat-topped threads, which die out on base of last whorl and are about half as broad as their slightly concave, weakly striate interspaces; first neanic whorl with 44 threads; second with 42; third with 37; fourth with 38 and last with 34. Aperture trapezoid-reniform with greatest dimension almost 30° to shell-axis; peristome slightly thickened, almost vertical and little arcuate; columella somewhat thickened and weakly sigmoid. Alt. 3.44, diam. 33 (1.14), alt. last whorl 41 (1.40); aperture alt. 23 (0.80), diam. 71 (0.57).

Las Tortolas, Córdoba (A, I, a, 4), 3000 ft.; quite rare. *S. subgranum* has heavier threads and a smaller apex than *S. parvus* and its sculpture is more sharply cut than that of *S. granum*. It differs